florets characteristic of a number of the Compositæ were present. This substitution was complete, no stigmas of Crocus being present.

The substitute was identified as a species of *Onopordon* closely related to *Onopordon sibthorpianum* Boiss and Heldr. The materials had been dyed with a mixture of Tartrazine and commercial Ponceau 3 R. It was weighted with a mixture of at least 5 per cent. potassium nitrate and borax. About 4 per cent. glycerin was also present. The material was evidently flavored with saffron oil.

Corrosion of Iron and Steel.—This important subject has been extensively studied, and the present state of opinion with a summary of much of the literature was presented in a communication by A. Pickworth, M.Sc., to the North-east Coast Institution of Engineers and Shipbuilders (Newcastle-upon-Tyne). Attention is called to the great waste that such corrosion involves and to the several theories of causes that have been proposed. It appears that iron does not rust in water containing only oxygen, but the presence of some substance giving rise to ionized hydrogen is required. Under ordinary conditions the active substance is carbonic acid, but, of course, other acids may be present, especially those produced by the oxidation of the organic matters of soil. The air of built-up areas is almost always contaminated with sulphur acids, and iron rust in such places usually contains notable amounts of sulphates. Electric conditions have an important bearing on corrosion. A difference of potential of the area exposed to water will determine the development of oxidation at certain points. Doctor Friend has recently investigated the subject with much care and offers a somewhat new theory. The oxidation of iron in contact with liquid water is catalytically accelerated by the ferric hydroxide hydrosol being alternately reduced by contact with the iron and oxidized again by contact with atmospheric oxygen.

Iron, in any of its forms, is attacked by a weak solution of carbonic acid, forming ferrous carbonate, which in the presence of free oxygen is converted into ferric hydroxide, thus again liberating carbon dioxide, which reforms the acid condition with the water, capable of repeating the process. It is evident that the small amount of carbonic acid normally in water may carry on the oxidation continually. Some years ago, a process for water purification was based on this principle. Ferric hydroxide has a high adsorptive power for organic matters, but is active only in the fresh colloidal state. By agitating water with iron scrap, fairly free from oil and rust, a green turbidity appears which soon changes to red. If now the water is filtered, a great deal of the organic matter will be held by the ferric hydroxide, which, of course, will be retained on the filter.

It has also been claimed that if bright iron is immersed in water

practically free from oxygen and carbon dioxide, a minute amount of colloidal iron will form which will immediately oxidize if the water is allowed to come in contact with air.

Rust commonly met with in steel structures consists chiefly of iron combined with oxygen and water, forming a ferric hydrate, and has usually the familiar reddish brown color, but the true color is often disguised by the presence of deposited dust and traces of paint.

The product of corrosion is bulky, porous and hygroscopic. These properties tend to accelerate rusting, as the corroding influences in the form of vapors or liquids are attracted by and readily pass through the existing layer. Moreover, iron rust is electro-negative to iron, and furnishes innumerable local Voltaic couples in the presence of an electrolyte, which accelerate corrosion. Here, again, it will be observed that the hygroscopic nature of the rust constitutes a favorable channel for the electrolytic action. Upon removing apparently dry flakes of ferric oxide from a structure, a layer of moisture is often found between them and the steel. Thus, it can be understood that when rusting has once commenced it will readily proceed. Doctor Andrews showed that 50 per cent. more rust was deposited the second year compared with the first. It is unfortunate that the oxide, which forms on the surface of steel or iron assists in the process of rusting while the oxide coatings of other less commonly used metals such as aluminium, lead and copper, form a layer which protects the metal below.

It is recorded that some rejected plates from the Britannia Bridge, left unprotected upon a wooden platform exposed to the wash and spray of the sea, at the end of two years were so corroded that they could be swept away with a broom. They had an original thickness of seven-sixteenths to three-fourths of an inch. Basing calculation on the amount of corrosion which had taken place in the steel of the Britannia Bridge which had been kept well coated and clean, Baker found that it would take about 1200 years to corrode the plates entirely. Roughly, the plates, which are well looked after, will last 600 times as long as neglected plates. These facts are mentioned to show that so far as corrosion is concerned, the serviceable life of a structure or vessel can be extended enormously by careful attention to cleaning and recoating. H. L.

Crystal Structure of Complex Cyanides.—ROSCOE G. DICKINSON, of the California Institute of Technology (*Jour. Am. Chem. Soc.*, 1922, xliv, 774–784), has determined the crystal structure of certain complex or "double" cyanides by means of spectral photographs and unsymmetrical Lane photographs. The salts studied were potassium zinc cyanide, potassium cadmium cyanide, and potassium mercuric cyanide. These complex cyanides were found to have the same crystal structure as the minerals magnetite (ferrous ferrite, Fe_3O_4) and spinel (magnesium aluminate, $MgAl_2O_4$). J. S. H.